LETTERS TO THE EDITOR.

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Meteorological Observations during the Passage of the Earth through the Tail of Halley's Comet.

I HAVE cursorily examined the records from ten registering balloons sent up from Ditcham Park and Pyrton Hill on May 18, 19, and 20. Nearly all the traces show large fluctuations of temperature; but such fluctuations have been observed before, and there is nothing that leads me to suppose that the passage of the earth through the tail of the comet, if, indeed, it occurred before 7 a.m. on May 20, had any effect on the temperature of the upper air. Five of the balloons reached 17 km. or more, and all exceeded 13 km. W. H. DINES.

June 6.

THE quantity of ozone in the atmosphere at great altitudes, which for some time has been the subject of an investigation by the writer, was estimated on May 18 and 19. It was thought that, in this way, some light might be thrown on the question as to whether any electrical discharges of any magnitude took place in the higher atmosphere during the transit.

The method of conducting these measurements is described in the Transactions of the Chemical Society (1910, xcvii., 868), and consists in the use of a concentrated solution of potassium iodide. It has been found in this work that very dilute ozone reacts with potassium iodide to give iodine, potassium hydroxide, and potassium iodate, the relative amounts of each varying with the temperature. This reaction enables a distinction to be made from oxides of nitrogen, which only give free iodine, and from dilute hydrogen peroxide, which gives iodine and potassium hydroxide, but no iodate.

Three successful experiments were made with the help of the meteorological balloons at about the time of the transit, and the following results were obtained:—

Time of ascent of balloon	Height attained km.	Amount of ozone per cubic metre air mgrm.
May 18, 9.40 p.m. ...	17 ...	0·51 (or 1 part in about $2·6 \times 10^6$)
,, 19, 2.10 a.m. ...	12 ...	0·54 (,, ,, $2·4 \times 10^6$)
,, 19, 6.30 a.m. ...	20 ...	0·43 (,, ,, $3·0 \times 10^6$)

The above quantities of ozone are not materially different from the amount usually present in the air at these altitudes. Thus the average of three measurements made on March 18 corresponds to 0·72 mgrm. ozone per cubic metre air.

There was also no appreciable change in the quantity of oxides of nitrogen. J. N. PRING.

Physical Laboratory, Manchester University.

Ooze and Irrigation.

AGES have passed since the cultivator first realised the value of rivers as agents in fertilising the soil. The Nile is the classical illustration, and everyone has learned in early life to think of Egypt as being dependent on the life-giving waters for its fertility. But have the reasons for that ever been sufficiently investigated? Probably the majority of people would say that the waters of the Nile bring down vast quantities of soil and disintegrated rock from the heart of Africa, and this earthy matter, held in suspension or carried down by the river in spate, contains the chemical elements which are essential to the growth of plants. I believe that is the usually accepted theory; but does it go to the root of things? Others find the secret in the action of bacteria. I grant the point, but do not think it fully accounts for the facts. I have for some years been engaged in the study of our fresh-water annelids and their place in the economy of nature. I had occasion a few days ago to bring home from the banks of one of our Midland rivers some of the ooze from its banks. When I collected it I found some half-dozen specimens of a common fresh-water worm wriggling about in the slimy mass; but when I came to examine it at leisure, with pocket lens and microscope, I found it to be teeming with life. Vast numbers of tiny annelids (*Tubifex templetoni*, Southern, or an allied species), minute larvæ, and other living things were to be seen, and at once the question arose, Would the ooze, detritus, alluvium, or disintegrated rock of itself be so special a fertiliser if this teeming life were absent? The ooze is enriched both by the passing of the matter through the bodies of the animals and by the nitrogen from their corpses.

It seems to me that there is need for careful study of the alluvium of rivers from this point of view. Life has probably much more to do with the soil of the Nile and other rivers than is generally suspected. It would be a profitable thing for students to examine the mud of rivers like the Nile during the different seasons. It would then probably be found that at low water various annelids and other aquatic life-forms were breeding rapidly. The myriads of young would be carried by the flood into the lands which are irrigated by the river, and here they would not only be the food supply for the larger forms of life, but would help to keep the soil from becoming sour, and supply vast stores of nitrogen for the plants. I should be happy to hear from workers in this field, and give any hints which experience has taught me.

Gt. Malvern. HILDERIC FRIEND.

On the Preservation of Hailstones and the Investigation of their Microstructure.

THE investigation of the microstructure of hailstones in summer having proved very difficult, if not impossible, I constructed an apparatus (Fig. 1) for their preservation

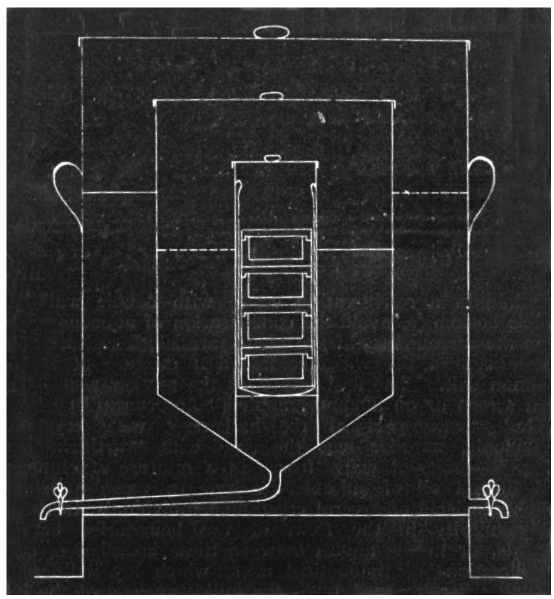

FIG 1.

until winter time. The apparatus consists of three co-axial cylinders; the inner space is intended for hail; the middle space for a mixture of ice and cupric sulphate (approximately in the proportion corresponding to eutectics $t = -1·6°$); the outer space for ice, forming a sort of guard coat.

During the summers of 1908 and 1909 I had only once the opportunity of observing a hailstorm; this was on August 2/15, 1909, when I was at sea near Helsingfors on my way from Åland to St. Petersburg. This hail lasted three to four minutes; the hailstones were very small (2–3 mm. diameter), but I gathered 200–300 grams of them, and, in order to avoid their freezing together, immersed them in glass boxes with a mixture of nearly equal parts of benzol and toluol, which I presumed to be of a density equal to the density of hailstones, but which proved to be lighter. These hailstones I brought later to Tomsk (Siberia), and in December sent them to the twelfth Congress of Russian Naturalists and Physicians in session at Moscow. These facts demonstrate thoroughly the possibility of the preservation and transport of hailstones. My

experiment has also shown that it would be better to preserve one or two hundred hailstones separate from each other than a greater number of them, but partly—especially in lower layers—frozen together. That can be attained by placing the hailstones in some very viscous liquid (*e.g.* cylinder-oil, vaseline, or castor-oil) of a density nearly equal to that of hail.

For the investigation of the microstructure of a separate hailstone Mr. W. Dudecki and I made a thin section of it by first rubbing one side on emery-paper or by melting it with the warmth of a finger. This side was laid upon an object-glass and frozen to it, after touching for some time with a finger the other side of the glass. The other side of the hailstone was then polished in the same manner as the first until the requisite thickness was attained. These operations were made in free air, and were so much easier, as the temperature of the air was below 0°. Still, it was found possible to grind hailstones in the laboratory at the temperature of the room by means of cooling the object-glass, the emery-paper, &c., in double-walled vessels with a mixture of ice and common salt.

For the optical investigation of thin sections in free air a polarising microscope was used, and in a lecture-room a projecting lantern. In the latter case (Fig. 2) the section

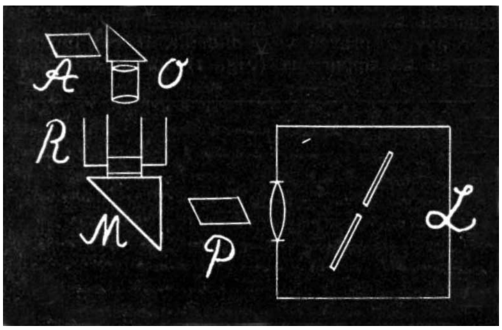

FIG. 2.—L, Projecting lantern; P, polariser; M, mirror; R, refrigerating vessel; O, objective; A, analyser.

was laid in a refrigerating vessel with double walls and double bottom (to avoid the condensation of aqueous vapour from the surrounding air) of plane-parallel glass plates. The space between the walls contained a mixture of ice and common salt. The real image of the section was thrown on a screen or on a photographic ("Autochrom") plate.

The greater part of the hailstones were crystalline individuals, as also was the case with "artificial hailstones"—drops of water frozen in a mixture of cinnamon and linseed oil of suitable density. In those hailstones, which consisted of several crystalline individuals, there was no regularity in the form of the boundaries between crystals, or in the angles between these boundaries, or in the directions of the optical axes, which lay indifferently to each other, as well as to the milky nucleus of the hailstone, which appeared in the section as a number of air-bubbles of different size.

I trust that my attempt will cause similar researches to be undertaken, and I should be very glad if anyone who may be able to preserve or study larger or more peculiar hailstones than I have hitherto done will do so, and in this way improve our deficient knowledge on the origin of hail and the details of its formation. BORIS WEINBERG.

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Thoughtless Destruction of Wild Flowers.

MAY I ask through your widely circulated paper that those who organise the weekly or fortnightly visits of poor town children to country villages may be requested to instruct these children to pluck only a limited number of wild flowers? It is no uncommon sight to see a dozen or more of these children going along a road or railway embankment and plucking every flower they can find, as well as rooting up those which are small enough. In half an hour the flowers have withered, and are thrown away, when the same process is repeated. GEO. HENDERSON.

Otford, Kent, May 27.

RECENT PROGRESS IN INDIAN FOREST TECHNOLOGY.

THE excellence of the work of any public department depends on the character and ability of the men who direct it, and the Indian Forest Department was singularly fortunate in its first Inspector-General, the late Sir Dietrich Brandis, K.C.I.E., F.R.S. He secured State ownership and State management for the forests both in British India and in the native States, and also a trained staff of forest officers. He placed Indian forest law on a firm basis by selecting as Conservator of Forests, Mr. B. H. Baden-Powell, C.S.I., a member of the Punjab Civil Service, who, after working for a decade of his life in the forest service, became presiding judge of the chief court at Lahore. Baden-Powell drafted the Indian Forest Acts, models of forest law that are followed by all colonial legislators, and his "Manual of Forest Jurisprudence" is the only English book on the subject. No mere forester could have drafted those laws successfully, nor could any mere lawyer, but Baden-Powell was both lawyer and forester.

Brandis also established a forest survey under Lieut.-Colonel F. Bailey, R.E., and Mr. W. H. Reynolds, and their maps gained gold medals at two Paris exhibitions, and were the first Indian maps that showed a good system of contour lines. A forest school for training native members of the provincial and executive staffs of the Forest Department was established in 1881, at Dehra Dun. Useful manuals of forestry, by Mr. E. E. Fernandez, and of botany, were published soon after the establishment of this school for the use of the students. Brandis also published a Forest Flora of Northern India, followed quite recently by his last great work, "Indian Trees," a forest flora for the whole of India. Mr. Kurz had previously written one for Burma and Major Beddome for Madras, while Mr. J. S. Gamble, C.I.E., F.R.S., published a splendid monograph of Indian bamboos. Gamble, under Brandis's direction, published, in 1881, a "Manual of Indian Timbers," and again, in 1901, after collecting material for twenty years, a new and greatly enlarged and improved edition. "The Indian Forester" first appeared in 1876, Dr. Schlich, now Sir W. Schlich, K.C.I.E., F.R.S., being the first editor. Schlich succeeded Brandis as Inspector-General of Forests in 1881, and instituted a proper system of working plans for Indian forests. He came home in 1885 and established a school of forestry at Coopers Hill, and, in conjunction with myself, published a "Manual of Forestry."

The training of men in England for the Indian Forest Service was not at first in accordance with the wishes of Brandis and Schlich. They recommended that the Imperial School of Forestry should be at an English university, and that, as the so-called Civil Service of India is recruited chiefly from university men of good literary and legal attainments, so the Imperial Forest branch of the Civil Service, which manages one-quarter of the land of British India, should be composed of university men of good scientific attainments. But the India Office wished to support the Royal Indian Engineering College at Coopers Hill, and kept the forest probationers there until 1905, the year before the college was closed. In 1905, an Imperial School of Forestry was established at Oxford under Sir William Schlich, and is now training more than seventy men for India, the colonies, and for forest work at home.

Until 1904 very little progress was made in Indian forest technology, for which Brandis had laid such a